

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	) Confirmation No.: 6667
Shunpei YAMAZAKI et al.	) Examiner: Britt D. Hanley
Serial No.: 10/577,472	) Group Art Unit: 2889
Filed: April 27, 2006	)
For: LIGHT-EMITTING ELEMENT	)
	)

**AFTER FINAL RESPONSE**

Honorable Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

The Official Action mailed October 28, 2009, has been received and its contents carefully noted. This response is filed within three months of the mailing date of the Official Action and therefore is believed to be timely without extension of time. Accordingly, the Applicant respectfully submits that this response is being timely filed.

The Applicant notes with appreciation the consideration of the Information Disclosure Statements filed on April 27, 2006; July 25, 2006; and February 7, 2008.

Claims 1-40 are pending in the present application, of which claims 1 and 20 are independent. For the reasons set forth in detail below, all claims are believed to be in condition for allowance. Favorable reconsideration is requested.

Paragraph 4 of the Official Action rejects claims 1-8, 10-12, 14-16 and 39 as obvious based on the combination of JP 2000-306669 to Akihiro; Tokito, "Metal Oxides as a hole-injecting layer for an organic electroluminescent device," J. Phys. D: Appl. Phys. 29 (1996) 2750-2753; and Tanaka, "Organic EL Device Using SrO<sub>x</sub> as an Electron Injection Material," Electronics and Communications in Japan, Part 2, Vol. 86, No. 7, 2003, pp. 73-80. Paragraph 21 of the Official Action rejects claims 9, 13 and 17-19 as obvious based on the combination of Akihiro, Tokito, Tanaka and U.S. Publication

No. 2005/0123751 to Tsutsui. Paragraph 25 of the Official Action rejects claims 20-38 and 40 as obvious based on the combination of Akihiro, Tokito, Tanaka and Tsutsui. The Applicant respectfully traverses the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2142-2144.04, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some reason to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

There is no proper or sufficient reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Akihiro, Tokito, Tanaka and Tsutsui or to combine reference teachings to achieve the claimed invention. MPEP § 2142 states that the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. It is respectfully submitted that the Official Action has failed to carry this burden. The test for obviousness is not whether the references "could have been" combined or modified as asserted in the Official Action, but rather whether the references should have been. As noted in MPEP § 2143.01, "The mere fact that references can be combined or modified does not render

the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art” (emphasis in original). KSR International Co. v. Teleflex Inc., 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1396 (2007). Thus, it is respectfully submitted that the standard set forth in the Official Action is improper to support a finding of *prima facie* obviousness.

The Official Action asserts that Akihiro discloses “first layer including a first organic compound and a first inorganic (paragraph 12); ... second layer including a second organic compound that is luminescent and a second inorganic compound (paragraph 12); ... third layer including a third organic compound and a third inorganic compound” (Paper No. 20091019, page 3). The Official Action concedes that Akihiro does not disclose “that the first inorganic compound exhibits an electron accepting property to the first organic compound or that the third inorganic compound exhibits an electron donating property to the third organic compound” but asserts that “Tanaka et al. disclose that the first inorganic compound is a metal oxide of VO<sub>x</sub>, MoO<sub>x</sub>, or RuO<sub>x</sub>” and that “Tokito et al. disclose a third organic compound is a metal oxide, such as an alkaline earth metal oxide, in particular SrO<sub>x</sub>” (Id., pages 3 and 4). Without establishing the level of ordinary skill in the art at the time of the present invention, the Official Action asserts that “it would have been obvious to one of ordinary skill in the art at the time of invention to a person having ordinary skill in the art ... to include the metal oxides of Tokito et al. and Tanaka et al. in order to decrease the drive voltage and increase the device luminance and lifetime (Id., page 3). The Applicant respectfully disagrees and traverses the above assertions in the Official Action. Specifically, for the following reasons, the Applicant respectfully submits that Akihiro cannot be theoretically or technically combined with Tokito and Tanaka in the manner suggested by the Official Action.

Initially, it is noted that Akihiro limits the fabrication method of the layer comprising an organic compound and an inorganic compound to the sol-gel method described at paragraph [0011] of Akihiro. The use of the sol-gel method is critical in

Akihiro and fundamental in obtaining "a very uniform dispersion state" of plural compounds in the layer, described at paragraph [0012]. That is, the sol-gel method must be applied to form a layer comprising an organic compound and an inorganic compound in Akihiro.

**Starting material for sol-gel reaction**

The sol-gel method is readily understood by those of ordinary skill in the art as a method to form a composite in which an organic moiety is uniformly dispersed in an inorganic matrix (typically, a silica matrix). In order to form a uniformly dispersed composite, the starting material must have at least one stable metal-carbon bond, which links the organic unit to the inorganic matrix. If no such carbon-metal bond is provided (that is, if the organic moiety is not bonded to the metal), then the organic moiety is readily phase-separated during the sol-gel reaction to form a phase-separated, heterogeneous material, because the organic compound originally has low affinity with inorganic compounds. For this reason, all compounds subjected to the sol-gel reaction in Akihiro possess a carbon-silicon bond (C-Si bond) which anchors the organic unit in the silica matrix (SiO<sub>2</sub>).

**Initiator of the sol-gel reaction**

It is also readily understood by those of ordinary skill in the art that the sol-gel reaction must include the substitution of the alkoxy group (e.g., ethoxy group (OCH<sub>2</sub>CH<sub>3</sub>), methoxy group (OCH<sub>3</sub>)) with a hydroxyl group (OH) to form a metal-hydroxyl bond and that this substitution reaction is initiated by water. That is, the addition of water as a reagent is indispensable in performing the sol-gel reaction, and, in accordance with this requirement, the examples described in Akihiro so include the use of water.

**Combination of Tokito or Tanaka with the sol-gel method**

It is well known in the art that the introduction of an organic moiety to an inorganic matrix through the carbon-metal bond of the sol-gel method is quite limited if the inorganic matrix is not based on a metal of groups 13 or 14 such as silicon. That is,

if the metal is not from groups 13 or 14, then a compound having a carbon-metal bond is generally quite unstable and cannot undergo a sol-gel reaction without cleaving the carbon-metal bond. For example, a bond between carbon and an alkaline earth metal, such as a C-Mg bond, is very unstable and readily reacts with a wide variety of organic functional groups including ester groups, carbonyl groups, etc. One such example is the Grignard reagent, which is one of the most fundamental and useful reagents in the field of chemistry. The C-Mg bond of the Grignard reagent also reacts very rapidly with protic solvents such as water and alcohol, which are used in the sol-gel reaction.

Strontium (Sr) is another alkaline earth metal. Accordingly, one of ordinary skill in the art would have readily understood that substituting strontium in place of the silicon metal of the compounds in Akihiro would potentially lead to a very unstable and reactive compound and would render the compound inadequate for the sol-gel reaction. For example, if such a substitution of silicon with strontium is attempted for the compound number 15 of Akihiro, the carbonyl group (C=O) in this compound is readily reacted with the carbon-strontium bond, which does not allow the formation of the target molecule. That is, combining Tanaka with Akihiro in the manner suggested by the Official Action would improperly change Akihiro's principle of operation and potentially render Akihiro unsatisfactory for its intended purpose.

One of ordinary skill in the art would also understand that, with respect to the carbon-transition metal bond, organometallic compounds based on vanadium, molybdenum or ruthenium and having a carbon-metal bond are also unstable because the high Lewis acidity of metals, such as vanadium and molybdenum, readily allows them to react rapidly with water resulting in their decomposition. Therefore, it is impossible to conduct the sol-gel reaction of Akihiro if the silicon atom is replaced with vanadium, molybdenum or ruthenium. Therefore, combining Tokito with Akihiro would also improperly change Akihiro's principle of operation and potentially render Akihiro unsatisfactory for its intended purpose.

As noted in MPEP § 2143.01, Part V, if a proposed modification renders the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Also, as noted in MPEP § 2143.01, Part VI, if a proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). If the silicon of Akihiro is substituted with vanadium, molybdenum or ruthenium from Tokito or strontium from Tanaka, then Akihiro would be rendered unsatisfactory for its intended purpose. That is, the Examiner's proposed modification or combination of the prior art appears to change the principle of operation of the prior art invention being modified. Therefore, there is no reason to make the proposed modification, and the teachings of the references are not sufficient to render the claims *prima facie* obvious.

The Applicant respectfully submits that Tsutsui, which is relied upon to allegedly teach a metal nitride for use in electrodes for hole injection, electron injection or both hole and electron injection (Paper No. 20091019, pages 4-7), does not cure the above-referenced deficiencies in Akihiro, Tanaka and Tokito. That is, for example, Tsutsui does not teach or suggest why one of ordinary skill in the art at the time of the present invention would have had any reason to combine Akihiro with Tokito and Tanaka in the manner suggested by the Official Action, as noted in detail above.

Therefore, the Applicant respectfully submits that the Official Action has not provided a proper or sufficient reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Akihiro, Tanaka, Tokito and Tsutsui or to combine reference teachings to achieve the claimed invention.

In the present application, it is respectfully submitted that the prior art of record, either alone or in combination, does not expressly or impliedly suggest the claimed


invention and the Official Action has not presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

For the reasons stated above, the Official Action has not formed a proper *prima facie* case of obviousness. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

The Commissioner is hereby authorized to charge fees under 37 C.F.R. §§ 1.16, 1.17, 1.20(a), 1.20(b), 1.20(c), and 1.20(d) (except the Issue Fee) which may be required now or hereafter, or credit any overpayment to Deposit Account No. 50-2280.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

  
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